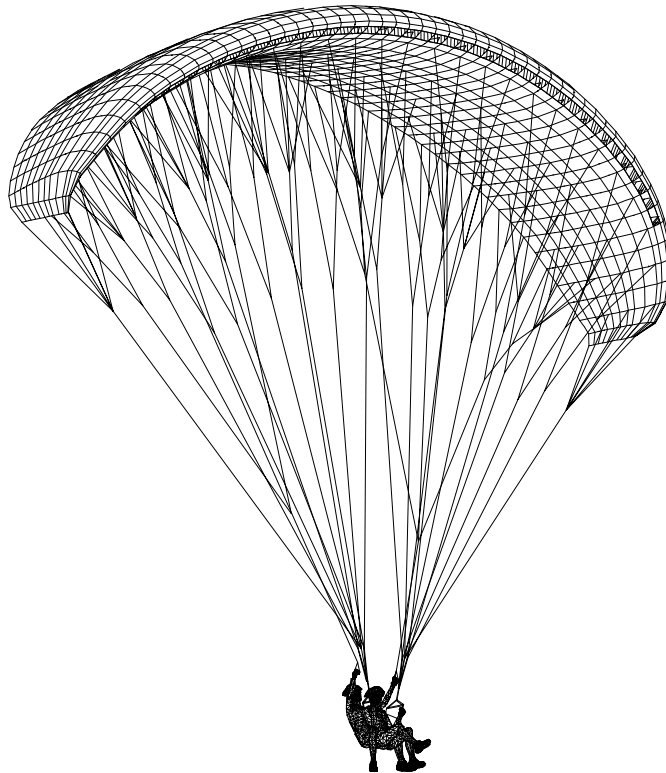


OPERATORS MANUAL



KANGAROO



WELCOME TO THE FAMILY OF SOL PILOTS !

We congratulate you on buying your new
SOL KANGAROO
and wish you many enjoyable hours of flying!

If you have any questions, doubts, suggestions
or constructive criticism regarding any SOL product please do not
hesitate to contact us.

We are happy to give help and advice.

SOL PARAGLIDERS
SOL SPORTS IND. E COM. LTDA.
RUA WALTER MARQUARDT, 1180
89259-700 JARAGUÁ DO SUL - SC
BRAZIL

NEW PHONE : + 55 47 370 7753
NEW FAX : + 55 47 370 7114
e-mail : info@solsports.com.br
on the web: www.solsports.com.br

We are looking forward to hearing from you !

PLEASE READ THIS MANUAL CAREFULLY AND NOTE THE FOLLOWING DETAILS

**THIS PARAGLIDER MEETS AT THE TIME OF DELIVERY THE
REQUIREMENTS OF THE DHV GÜTESIEGEL (GERMAN HANG /
PARAGLIDING ASSOCIATION'S CERTIFICATE OF AIRWORTHINESS) OR OF
THE AFNOR (SHV AND AEROTESTS).**

**ANY ALTERATIONS TO THE PARAGLIDER WILL RENDER ITS
CERTIFICATION INVALID !**

THE USE OF THIS PARAGLIDER IS SOLELY AT THE USER'S OWN RISK !

MANUFACTURER AND DISTRIBUTOR DO NOT ACCEPT ANY LIABILITY.

**PILOTS ARE RESPONSIBLE FOR THEIR OWN SAFETY AND THEIR
PARAGLIDER'S AIRWORTHINESS.**

**THE AUTHOR ASSUMES, THAT THE PILOT IS
IN POSSESSION OF A VALID PARAGLIDING
LICENCE FOR TANDEM FLIGHTS !**

Technical Data

Model KANGAROO		
Tipo		1
Zoom factor		1
N.° of cells		48
Projected wingspan	m	11.55
Projected surface area	m²	34.55
Projected aspect ratio		3.86
Flat wingspan	m	14.60
Flat surface area	m²	42
Flat aspect ratio		5.1
Line diameter	mm	1.1-1.7-2.1
Line length	m	8.70
Line consumption	m	539
max. profile depth	m	3.52
min. progile depth	m	0.8
Weight	kg	9.5
Legal take-off weight *	kg	140/200
Mon. sink	m/s	1.1
Vel. min	km/h	23
Vel. trimm	km/h	41
Vel. max.	km/h	
Finesse		8
Places		2
AFNOR/CEN		Tandem
Homologation number		

* Pilot + Passenger + harnesses + canopy

Line specifications are detailed in the line plans, they are measured under a 5 kg load.

The line lengths as specified in the line plans include the end loops.

The paragliders' details are in the central cell.

Date and pilot of test flight will have to be written in space provided !

SOL KANGAROO : Technical Description

The SOL KANGAROO represents a perfect combination of performance and safety.

The KANGAROO is a slim, elliptical wing with a slightly rearward swept plan form. 48 cells ensure a smooth top surface, exact airfoil reproduction, and yet most importantly, fewer suspension points. The KANGAROO has greatly reduced the number of lines used and thus the associated parasitic drag, which especially at high speed, gives it an exceptional glide angle and an easy handling for a Tandem glider.

Eight additional cells form a clean wing tip and stabilisers ensure stable straight flight and coordinated turns.

The profile of the KANGAROO was selected from a large range of outstanding computer calculated, aerofoils. This aerofoil offers above all, excellent stability.

The KANGAROO presents a closed leading edge to the airflow, while internal Mylar reinforcements maintain its precise form. The cell openings of the KANGAROO are on the undersurface. Integrated, stretch resistant Dacron flares at the suspension points ensure equal distribution of load throughout the canopy.

Large cross port vents allow effective airflow inside the canopy, providing good reinflation without affecting the profile of the canopy.

Rigging system

The lines of the SOL KANGAROO are made of a strong and stretch resistant sheath-core construction: the sheath consists of coloured polyester with a core of white Polyethylene or brown Technora.

The rigging system comprises individual lines looped and stitched at each end. The main lines and the main brake lines are 2.15 mm in diameter, the lines with 1.7 mm, and the break lines with 1.1 mm.

An annual inspection of the SOL KANGAROO should be carried out by the manufacturer or distributor.

Main lines cascade 2 to 4 middle lines together and lead to the "quick link" (a Maillon Rapide that connects lines and risers). Also "**stabiliser lines**" connect the upper stabiliser lines on the outer suspension points to a quick link.

The "control/brake lines" are not suspension lines. They lead from the trailing edge of the canopy to the "main control/brake line" running through the "pulley" at the C-risers to the "control handle".

A-lines, A -risers and control lines are coloured different for better distinction.

The line connections are triangular maillon rapides (quick links) fitted with heat shrink preventing any slipping of the lines on the quick link.

The control lines are attached to suspension tabs, each of which is sewn to the trailing edge.

The main control lines are attached to the control handles at their optimum trimming point, which is also marked on the line. This adjustment, on the one hand, allows sufficient brake to be applied during extreme flying situations and landing, while on the other hand it ensures that the canopy is not permanently braked. This trimming should not be altered.

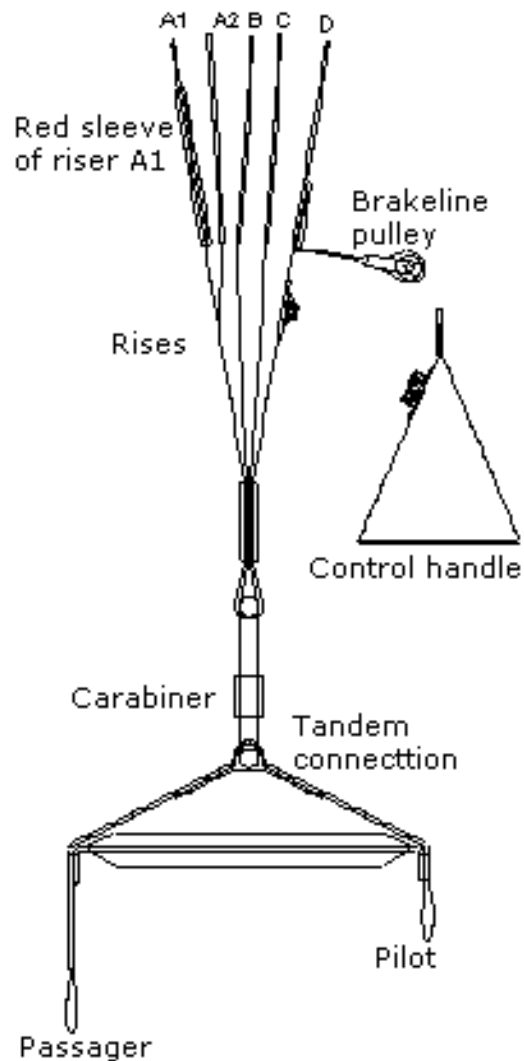
The KANGAROO has 4 risers. All A-lines are attached to the "A1"-riser, one line to the "A2"-riser thus facilitating rapid descents by doing "Big ears". The B-lines are attached to the B-riser, the C-riser leads to all the C-lines and the break, D in the D.

Comparing with a mono glider, the risers of the KANGAROO are shorter in order to compensate the height of the tandem connection that connects the passenger with the pilot.

The pilot is connected behind the passenger on the shorter end of the tandem connection thus reaching easier the control handles and risers.

In case of a big weight difference between pilot and passenger, the tandem connection offers various points to fix the passenger always maintaining the ideal position of balance.

Details
Riseres / Tandem connection



Harness

Any harness with a hang point at about chest height may be used with a SOL KANGAROO.

Please note, the hang point position changes the position of the brakes relative to the pilots body.

Caution !

Too tight cross straps can drastically effect the handling, and thus may not actually contribute to higher safety. Have them tightened the correct amount.

Flight

Preflight check

A thorough preflight check is essential for any aircraft, the SOL KANGAROO is no exception.

Due to the responsibility for the passenger the pilot has to be in possession of a valid paragliding license for instruction flights and keep his equipment always checked and inspected.

Attention should be paid on the facts that the launch with a Tandem glider requires more room and launching in two persons turns corrections of direction more difficult.

Having unpacked and laid out the paraglider in a horseshoe the following checks must be made:

The paraglider should be arranged in such a way that the A-lines in the centre section of the canopy will tension before the ones at the wing tips. This ensures an easy and balanced launch.

All lines and risers should be untangled and arranged in a way that they do not catch on anything. Special attention should be paid to the A-lines, which should run free and untangled from the A-risers (red sleeve) to the canopy.

It is equally important to untangle the control lines so that they are clear and cannot get caught during launch.

Only then is the final decision to continue the launch taken !

When deflating the canopy in strong winds, if aborting a launch, use the C- risers, not the brakes. Using the brakes in strong wind will cause more lift, lifting the pilot and passenger up and dragging them much further back.

The SOL KANGAROO is easy to reverse launch.

In this case, the passenger just remains in launch direction and the pilot is turned to the canopy with the risers and the tandem connection twisted.

Even in strong winds the SOL KANGAROO has excellent characteristics launching in the common way. If possible, the pilot may launch this way in order to the higher risk especially for the passenger in a reverse launch.

Turns :

The SOL KANGAROO is very responsive, it has exceptionally easy handling and reacts instantly, to any steering input. Weight shift input quickens turns and also results in wide and flat turns with minimal height loss.

A combined technique: weight shift and pulling on the appropriate control line is the most efficient turning method for any situation, whereby the radius of the turn is determined by the amount of inside brake pulled and weight shift. Applying a little outside brake in turns, after the initiating the turn with maximum weight shift, increases efficiency and also the outside wing's resistance to collapsing in turbulence (edge of thermals).

In case it is necessary to turn the SOL KANGAROO in a confined area at slow speed, it is recommended to steer the decelerated canopy by loosening the brake at the outside of the turn while applying a little more brake on the inside of the turn.

For the SOL KANGAROO the best glide is attained with no brake pressure applied. In large areas of smooth lift, as little brake as possible should be used for minimising sink rate. Note: apply brakes as normal if turbulence is encountered.

WARNING :

Pulling one brake too hard or too fast can result in the canopy entering a negative spin.

Spiral dive :

To enter a spiral dive with a SOL KANGAROO the pilot must slowly apply more and more brake on one side, to initiate an increasingly steeper turn which eventually results in a spiral dive.

During a spiral dive the angle of bank can be controlled by increasing or reducing the amount of inside brake. To exit, ease off inside brake slowly.

Induce and recover slowly from a spiral dive !

Depending on the point of gravity of the pilot / passenger, the SOL KANGAROO could turn some more times or tend to continue in spiral dive after ease off the manoeuvre. In this case, to help the recovery, the outside brake should be moderately applied.

Due to the rapid loss of height encountered during a spiral dive (more than 20 m/sec) sufficient altitude is essential for this manoeuvre!

Spiral dives can also create very high G-forces, placing high loads on the glider's structure, the pilot and the passenger. Be careful not to overload it and yourself !

NEVER DO BIG EARS IN SPIRALS, AS THIS MAY DRASTICALLY REDUCE THE NUMBER OF LINES TAKING THE ALREADY HIGH LOADS, POSSIBLY CAUSING STRUCTURAL FAILURE.

Thermaling and soaring :

In turbulent conditions the canopy should be flown with a small amount of brake applied. This improves stability by increasing the angle of attack of the canopy. The canopy should not rock back or surge forward but should remain above the pilot. Thus, the pilot should increase speed by letting the controls up when entering a thermal (according to its strength) and should brake the canopy on exiting. This is part of basic active flying.

When soaring a minimum height of 50 m above ground level is recommended for safety reasons. It is important to comply with the rules of the air, especially when many pilots share airspace close to a hill where last minute avoidance manoeuvres are often not possible.

With an active flight style, many potential collapses of the canopy can be avoided.

Landing :

The SOL KANGAROO is easy to land.

Doing the transversal leg of the landing approach, the pilot may inform the passenger to uprise in the harness for landing.

The final leg of the landing approach must be into wind. During this final glide the paraglider should be decelerated slowly and at approximately 1 meter above the ground the pilot should “flare” the canopy, according to conditions. The glider may climb again, gaining height, if too much brake is used.

Strong wind landings require hardly any brake, if any at all ! Use C-risers to deflate the canopy after landing. Using the brakes will result in pilot and passenger being lifted and dragged backwards.

The final glide during the landing approach should be straight and not marked by steep or alternating turns as these can result in a dangerous pendulum effect near the ground.

Winching :

The SOL KANGAROO has no special winching characteristics, although a relatively low angle of attack and thus low tow tension, should be maintained during launch.

Motored Flight / Aerobatics :

The SOL KANGAROO is neither designed to be used for motorised flight nor for aerobatics.

Extreme Flying Manoeuvres

EXTREME FLYING MANOEUVRES SHOULD ONLY BE CARRIED OUT DURING SAFETY TRAINING COURSE (INSTABILITY TRAINING) UNDER PROPER INSTRUCTION !

Tuck :

A negative angle of attack will cause the SOL KANGAROO, like any other glider, to tuck.

If one wing tucks, straight flight is maintained by “correcting for direction”, braking gently on the inflated side.

The pilot’s “correction for direction” can be aided by a “pumping out of the deflation”, a slow, long pumping action on the brake of the deflated side of the wing helps the canopy to re-inflate.

In case of a big tuck this braking should be very gentle to avoid the remaining inflated canopy from stalling. Weight shifting away from this collapsed side also helps, allowing less brake to be used and thus a greater margin of safety from the stall point.

If the pilot does not correct for direction, the canopy usually self-recovers, in smooth air, in less than 1 complete turn. In case the canopy does not recover by itself, the appropriate amount of brake must be applied to correct for direction and exit the turn otherwise the glider will enter a spiral dive.

If this spiral dive is entered, it should be exited by slowly and gently applying the outside brake until the canopy starts to retain a level bank angle. Just at this phase, when the pilot pendulums under and in front of the canopy, it is vital that the brakes are applied very gently, feeling the pressure and not applying too much. In fact, often it is necessary to partially release the brakes. When the glider is flying straight and level again, “pump out” the collapsed side.

IF THE ABOVE SPIRAL IS NOT ACTIVELY EXITED FROM BY THE PILOT, IT WILL CONTINUE UNTIL IMPACT !

THE FORCES ACTING ON THE BRAKES OF A TANDEM GLIDER ARE SIGNIFICANTLY HIGHER THAN ON A MONO GLIDER. IN A SPIRAL WITH TUCK THEY INCREASE EVEN MORE !

The SOL KANGAROO surges forward a little bit after recovering from a full stall whereby a tuck may occur.

An “asymmetric” recovery (one control released faster than the other) from a full stall is only used by test pilots to simulate a paraglider falling out of a thermal and must not be practised by pilots.

An asymmetric recovery from a full stall may result in a big, dynamic, tuck.

The danger of overcorrecting and overreacting exists during all extreme flight manoeuvres: Thus, any corrective action must be gentle and steady and done with feel !

Spin :

A spin is induced when the pilot in full speed (DHV test) or in very slow flight (AFNOR) pulls one brake line all the way down very hard and very quickly.

During a spin the canopy turns relatively fast around the centre section of the canopy while the inner wing flies backwards.

To recover from a unintentional spin, the pulled down brake / control line should be immediately eased off as soon as the situation is noticed, so that the canopy may accelerate and return to its normal straight and stable flying position, without losing too much height.

For recovery from an intentional spin, also release pulled down control line. Watch for and dampen any surging.

In case the spin is allowed to develop for some time, the SOL KANGAROO surges forward on one side and a big and dynamic asymmetric tuck can occur. If so brake gently to stop canopy surging, correcting tuck : see “tucks “.

Wingover :

To induce a wingover the pilot flies consecutive alternating turns to gradually steepen the angle of bank. Too steep an angle of attack will result in a collapse, which may be quite dynamic.

Warning:

A turn with more than a 60 degree angle of bank is illegal aerobatics !

Front stall :

If the pilot pulls both A-risers a front stall is induced: the entire leading edge tucks and the canopy generally forms a frontal horseshoe.

THE SINK RATE FROM THIS MANOEUVRE CAN BE VERY HIGH. ENSURE YOU HAVE ENOUGH HEIGHT.

THE AXION USUALLY SELF RECOVERS FROM A FRONTAL STALL AFTER RELEASING THE A-RISERS. TO HELP THE RECOVERY, BOTH BRAKES SHOULD BE MODERATELY APPLIED.

Line over :

If for any reason, lines are tangled or looped around the canopy during flight, the following action should be taken:

Maintain straight flight by gently and feel fully correcting for direction!

Check the situation carefully and once the line(s) looped around the canopy, is/are identified pull it/them gently to untangle.

Pumping of the brakes in a line over doesn't always work.

If a very large unrecoverable collapse and line over occurs, it may be possible, to clear the problem by entry and safe recovery from a full stall. This should only be carried out if sufficient altitude is available. If insufficient height is available (300m/1000ft), or if in any doubt, the pilot should strongly consider reserve deployment.

Deep stall :

The SOL KANGAROO generally does not remain in deep stall, and is self recovering, when releasing any brake or rear riser input used to enter it . In case the recovery from a B-stall was not dynamic enough and the canopy remains in a deep stall, it is sufficient to gently pull down both A- risers to reduce the angle of attack and re-attach airflow to the canopy.

Emergency steering :

In case it is impossible to control the SOL KANGAROO with the control lines the outer D-lines, D-risers may be used to steer and land the canopy.

Rapid Descents

Spiral dive :

Spiral dives as explained previously have a rapid descent rate, however, the very high G-forces make it difficult to sustain a spiral dive for long and it can place high loads on the pilot, the passenger and glider. Never do these in turbulence or at too high bank angles.

If done in strong winds the pilot may drift off course.

NEVER DO BIG EARS IN A SPIRAL !

DHV-tests have proven that loads can be developed higher than those used in certification tests, which could result in structural failure of the glider, as less lines are taking these high loads.

Big ears :

The outer cells of the wing tips may be deflated by pulling down the outer A-lines through the A2.

Keep hold of the control handles together with the A2-risers.

The canopy remains completely controllable through one sided braking or weight shift. It maintains straight flight but with an increased sink rate (up to approx. 5 m/sec).

On releasing the A2-risers the canopy usually reinflates by itself or can be aided by a long pump on the brakes and holding them until tips clear.

B - line - stall :

To induce a B-line-stall pull both B-risers simultaneously by 50 - 60 cm. The airflow over the top surface is detached and the canopy enters a parachutal-stall without moving forward.

Further pulling of the B-risers reduces the surface area and increases the sink rate (to approx. 10 m/sec).

On quickly releasing the B-lines the airflow over the top surface becomes re-attached and the canopy surges forward to return to normal flight without applying brakes.

If canopy does not recover see section „Deep Stall“.

If B-risers are pulled too quickly or too far, the canopy can form a frontal horseshoe. To recover from this, apply both brakes gently to recover.

ALL RAPID DESCENT TECHNIQUES SHOULD BE PRACTISED IN SMOOTH AIR AND WITH SUFFICIENT HEIGHT SO THAT THEY CAN BE EMPLOYED WHEN NECESSARY IN EXTREME FLYING CONDITIONS ! FULL STALLS AND SPINS ARE TO BE AVOIDED AS WRONG RECOVERY PROCEDURES, IRRESPECTIVE OF THE TYPE OF PARAGLIDER, MAY HAVE DANGEROUS CONSEQUENCES !

**BY FAR THE BEST TECHNIQUE IS TO FLY CORRECTLY AND SAFELY,
SO YOU NEVER HAVE TO DESCEND RAPIDLY !**

Looking after your Paraglider

Looking after your canopy correctly will prolong the life of your SOL KANGAROO.

Storage :

Store the paraglider in a dry space away from chemicals and UV light. Never pack up or store the glider wet. This shortens the life of the cloth. Always dry glider thoroughly before any packing or storage.

Cleaning :

Clean the paraglider with water and a soft sponge. Do not use any chemicals or spirits for cleaning, as these can permanently damage the cloth. Stubborn stains or animal droppings should be immediately removed with methylated spirits, rinsed with water and then thoroughly dried.

Repair :

Repairs should only be carried out by the manufacturer, distributor or authorised workshops.

Deterioration : a few tips !

The SOL KANGAROO is mainly made of NYLON, cloth which, like any synthetic material, deteriorates through excessive exposure to UV. Hence, it is recommended to reduce UV exposure to a minimum by keeping the paraglider packed away when not in use. Even when packed in the bag do not leave in the sun.

The lines of the SOL KANGAROO are made of an inner core of Polyethylene or Technora and an outer sheath of polyester. Any over stretching of lines apart from the strain imposed during, should be avoided as over stretching is irreversible. Ensure that the lines are not folded tightly.

Keep the canopy and lines clean as dirt may penetrate into the fibre and shorten the lines or damage the cloth.

Be careful, not to allow snow, sand or stones to enter inside the canopy's cells : the weight can brake, or even stall the glider, as well as the sharp edges can destroy the cloth !

Prevent lines from catching on anything as they may be over stretched. Do not step onto the lines.

cells : the weight can brake, or even stall the glider, as well as the sharp edges can destroy the cloth !

Prevent lines from catching on anything as they may be over stretched. Do not step onto the lines.

Uncontrolled strong wind take offs or landings can result in the leading edge of the canopy hitting the ground at high speed which may cause rips in the profile and damage the material.

The control line can chafe if badly tangled.

Check line length after tree or water landings. They can stretch or shrink lines.

Clean the paraglider with fresh water after contact with salt water. Salt water crystal can weaken line strength, even after rinsing in fresh water.

Replace lines immediately after contact with salt water.

Also check canopy material after water landings, as waves can place uneven forces and cause cloth to distort in specific areas.

Always remove gliders from the water by holding only the trailing edge.

Do not always fold the canopy symmetrically to the centre cell as this can cause constant stress on the centre cell (centre cell always to the outside).

A line plan is enclosed in this operators manual or may be requested from the manufacturer or distributor.

In Conclusion

The SOL KANGAROO is at the forefront of modern paraglider design.

You will enjoy many safe years of flying with your SOL KANGAROO if you look after it correctly and adopt a mature and responsible approach to the demands and dangers flying can pose.

It must be clearly understood that all air sports are potentially dangerous and that your safety is ultimately dependent upon you.

We strongly urge you to fly safely. This includes your choice of flying conditions as well as safety margins during flying manoeuvres.

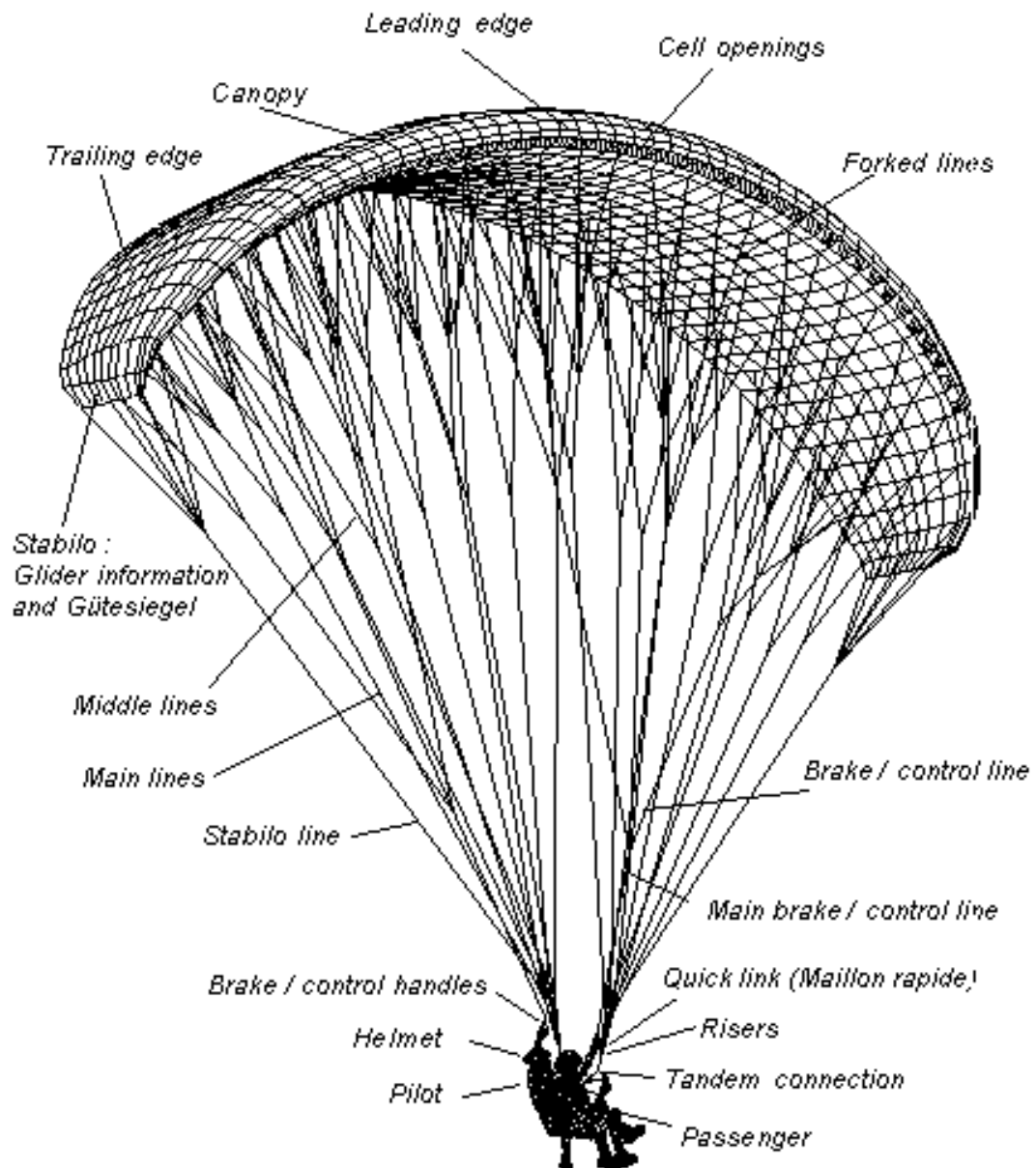
We recommend once more that you only fly with reserve chute and helmet.

FLYING YOUR CANOPY IS AT YOUR OWN RISK !

SEE YOU IN THE SKY !

SOL TEAM

OVERALL PLAN



LINE PLAN

FLIGHT LOG

MODEL : _____

SIZE : _____ SERIAL No. _____

PURCHASED FROM: _____ DATE : _____

TEST FLOWN BY : _____ DATE : _____

[illegible]

INSPECTION CHECK LIST

MODEL : _____

OWNER : _____

ADDRESS / FONE : _____

DATE OF INSPECTION : _____

CONDITION

LEADING EDGE CELL OPENINGS	_____
DACRON RE-ENFORCEMENT	_____
TOP SURFACE PANERS	_____
BOTTOM SURFACE PANERS	_____
TRAILING EDGE	_____
BRAKE / CONTROL LINE ATTACH. POINTS	_____
A LINES UPPERS	_____
B LINES UPPERS	_____
C LINES UPPERS	_____
A LINES MIDDLES	_____
B LINES MIDDLES	_____
C LINES MIDDLES	_____
A LINES MAINS	_____
B LINES MAINS	_____
C LINES MAINS	_____
BRAKE / CONTROL LINES	_____
INTERNAL CELL WALLS AND VENTINGS	_____
RISERS	_____
MAILLON RAPIDES	_____
BRAKE / CONTROL HANDLES	_____

COMMENTS :

Sol Warranty - Three Years or 300 Flight Hours

Every paraglider produced from January 1, 2000 has a three year or 300 flight hour warranty, whichever comes first. Our development technology, the use of new materials and new manufacturing processes, makes this offer possible for our customers.

Warranty Terms

- 1) This warranty is valid for materials and mistakes on manufacturing processes being observed under predefined conditions.
- 2) This warranty is for every SOL paraglider AFNOR, CEN or DHV rated for leisure use only. This does not include professional equipment.
- 3) Warranty conditions:
 - 3.1) A three part form should be filled out correctly and sent to SOL Paragliders during the 30 day period after purchase. One copy is kept by the owner and another one is kept by the dealer.
 - 3.2) A flight log should be kept including the flight date, place and time.
 - 3.3) The equipment must be operated and maintained strictly following the instructions which are in the owner's manual. This includes the storage, folding, and cleaning of the glider.
 - 3.4) The maintenance and checking of equipment must be done only by the manufacturer or an authorized shop and a record should also be kept.
 - 3.5) The paraglider must be inspected annually or after every 100 flight hours if this amount of flights is reached before a year. Without this annual inspection, the paraglider loses its certification and the warranty.
 - 3.6) All shipping and handling expenses are paid by the owner.
 - 3.7) The final decision on exchanging or repairing a piece of equipment will be decided by SOL Paragliders. The owner must send to SOL Paragliders:
 - a) The paraglider to be exchanged or fixed and a copy of all inspections and a log of all flights.
 - b) The original copy of the SOL Paragliders warranty form.
- 4) This warranty doesn't cover:
 - a) Alteration of its original fabric, lines and risers.
 - b) Damage caused by chemical means, sand, friction, cleaning products or salt water.
 - c) Damage caused by inappropriate handling, accidents or emergency situations.
 - d) Damage caused by inappropriate operation of the paraglider.
 - e) Paragliders that have suffered any kind of alteration from its original form without SOL's official authorization.

Thank you for flying the SOL PRYMUS!